



US006339409B1

(12) **United States Patent**  
**Warnagiris**

(10) **Patent No.:** **US 6,339,409 B1**  
(45) **Date of Patent:** **Jan. 15, 2002**

(54) **WIDE BANDWIDTH MULTI-MODE  
ANTENNA**

(75) **Inventor:** **Thomas J. Warnagiris**, San Antonio,  
TX (US)

(73) **Assignee:** **Southwest Research Institute**, San  
Antonio, TX (US)

(\*) **Notice:** Subject to any disclaimer, the term of this  
patent is extended or adjusted under 35  
U.S.C. 154(b) by 0 days.

(21) **Appl. No.:** **09/768,433**

(22) **Filed:** **Jan. 24, 2001**

(51) **Int. Cl.<sup>7</sup>** ..... **H01Q 1/36**

(52) **U.S. Cl.** ..... **343/895; 343/793**

(58) **Field of Search** ..... **343/793, 795,**  
**343/796, 803, 810, 872, 895**

(56) **References Cited**

**U.S. PATENT DOCUMENTS**

4,169,267 A 9/1979 Wong et al. .... 343/895

4,649,396 A 3/1987 Friedman ..... 343/705  
4,697,192 A 9/1987 Hofer et al. .... 343/895  
5,216,436 A 6/1993 Hall et al. .... 343/895  
5,349,365 A 9/1994 Ow et al. .... 343/895  
5,479,182 A 12/1995 Sydor ..... 343/895  
5,668,559 A 9/1997 Baro ..... 343/702  
5,892,480 A 4/1999 Killen ..... 343/385  
6,150,984 A \* 11/2000 Suguro et al. .... 343/895  
6,278,414 B1 \* 8/2001 Filipovic et al. .... 343/702

\* cited by examiner

*Primary Examiner*—Tan Ho

(74) *Attorney, Agent, or Firm*—Baker Botts L.L.P.

(57) **ABSTRACT**

A wideband multi-mode antenna having low VSWR operating characteristics. The antenna is has a shape similar to a helical antenna, but is formed from a right-triangularly shaped piece of conductive material. The result is a rolled planar antenna having a height and diameter predetermined to provide optimum VSWR for a given frequency range.

**33 Claims, 5 Drawing Sheets**

